PLANT PROTECTION BULLETIN

A Publication of the
WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

VOL. VI, No. 11 AUGUST 1958

CONTENTS

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ROME

FAO PLANT PROTECTION BULLETIN

is issued as a medium for the dissemination of information received by the World Reporting Service on Plant Diseases and Pests, established in accordance with the provisions of the International Plant Protection Convention, 1951. It publishes reports on the occurrence, outbreak and control of pests and diseases of plants and plant products of economic significance and related topics, with special reference to current information. No responsibility is assumed by FAO for opinions and viewpoints expressed in the Bulletin.

Manuscripts for publication, or correspondence regarding the World Reporting Service, should be addressed to Dr. Lee Ling, Plant Production Branch, Agriculture Division, FAO, Viale delle Terme di Caracalla, Rome, Italy; subscriptions and other business correspondence to the Distribution and Sales Section, FAO, Viale delle Terme di Caracalla, Rome, Italy.

The Bulletin is issued monthly in English, French, and Spanish, and twelve numbers, commencing with the October issue in each year, constitute a volume. Subscription rates are $ 3.00 or 15s. per annum; single numbers are priced at $ 0.30 or 1s. 6d. The citation is FAO Plant Protection Bulletin, or, in abbreviation, FAO Plant Prot. Bull.

FAO Plant Protection Bulletin

VOL. VI, No. 11 A Publication of the AUGUST 1958

World Reporting Service on Plant Diseases and Pests

Also publ. in News Lett. int. Rice Comm., 2, 3, pp 1-7, 1958

The Hoja Blanca Disease of Rice

JOHN G. ATKINS and JUDSON U. MCGUIRE, Jr.

Crops Research Division and Entomology Research Division respectively, Agricultural Research Service, United States Department of Agriculture

HOJA blanca or white leaf, a destructive insect-transmitted virus disease, has been recognized as a potentially serious disease of rice crop in the United States. In 1956, rice specialists of the U. S. Department of Agriculture and the state experiment stations became interested in hoja blanca in view of the heavy yield losses in Cuba and Venezuela. In 1957, studies were initiated in Cuba and Venezuela.

Distribution

In 1956 hoja blanca was recognized as one of the more destructive rice diseases of Cuba. However, the disease was observed in Cuba only in 1954 by Mr. Henry M. Beachell, Agronomist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, and Dr. Julián Acuña, Plant Pathologist, Ministry of Agriculture, Havana, Cuba. While the disease was evidently of little importance in 1954, it increased rapidly in 1955 and caused serious losses on some farms. Cralley (5) observed the disease in Panama as early as 1952, where it was apparently of minor importance. Malaguti (10) reported that hoja blanca appeared in 1956 in Venezuela and caused severe yield losses, particularly in Portuguese state. In letters to the U. S. Department of Agriculture, Dr. Eddie Echandi, Plant Pathologist, University of Costa Rica, and Mrs. Lucy H. de Gutiérrez, Plant Pathologist, Institute of Agricultural Sciences, Turrialba, reported that hoja blanca was found in 1957 in Costa Rica. In January 1958, hoja blanca was identified in Colombia by Dr. C. Roy Adair, Agronomist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, and Dr. Peter R. Jennings, Geneticist, Rockefeller Foundation, together with representatives of the Ministry of Agriculture of Colombia.

Hoja blanca was identified in early September of 1957 on rice near Belle Glade, Florida, although suspected plants had been observed in August (1, 4, 6). The diseased rice was destroyed and the areas sprayed with an insecticide. The writers wish to point out that the Florida rice acreage around Belle Glade is several hundred miles distant from the important southern rice areas but do not wish to minimize the importance of the occurrence of the hoja blanca in Florida.

Losses

Hoja blanca causes slight to nearly complete yield losses, depending upon the extent of infection. Losses of 40 to 75 percent for individual fields have been common. While reliable estimates or records for geographical units (states, provinces, etc.) are not available for Cuba and Venezuela, losses in certain of the leading rice areas have been disastrous. Losses on individual rice farms have been such as to render the growing of susceptible varieties unprofitable.

Symptoms

Hoja blanca symptoms consist of one or more narrow, longitudinal white stripes of the leaf blade, nearly white leaf blades, or leaves mottled in a mosaic pattern. Diseased plants show considerable variation as to

type of foliar symptoms. Both normal and diseased tillers frequently are observed on the same plant. Affected tillers are reduced in height. The panicles of diseased tillers are somewhat reduced in size, often are not fully exserted from the sheath, and they break easily at the lower end of the top internode when pulled upward. The lemma and palea frequently are distorted in shape, dry out rapidly and show a brownish discoloration. The floral parts are often absent, or if present they are sterile. As a result, panicles of diseased plants contain few or no seeds and remain in an upright position.

While there seems to be some disagreement among specialists as to when symptoms first appear under field conditions, plants should be at least in the four-leaf stage or approximately 30 days old for diagnostic purposes. Malaguti, Diaz and Angeles (11) observed symptoms 23 days after the initial feeding of viruliferous insects. Acuña (2) obtained symptoms after 16 days.

Infected plants, unless infected at a very early stage, are not killed by the disease, and new tillers of a second or ratoon crop often show no symptoms. Entries rated as resistant in the first crop were also resistant in the second crop in one of the 1957 nurseries.

Host Range

While the host range of hoja blanca has not yet been established by inoculation studies, the disease is suspected of having a fairly wide host range among grasses. Several different grasses growing in or adjacent to the fields of diseased rice often show symptoms similar to those for hoja blanca on rice (3, 4, 5, 7, 10, 12). While *Echinochloa* species exhibit quite distinct symptoms, other grasses show only obscure symptoms which may or may not be due to the hoja blanca virus or to any virus.

Red rice is also susceptible to hoja blanca. While red rice belongs to the same species as our cultivated varieties, it is considered as a weed pest in commercial rice fields.

Factors Influencing Disease Development

Surveys and reports indicate that the severity of hoja blanca varies with the field, the area, the country, the year and the season or month. Future studies will undoubtedly provide information as to the factors responsible for differences in the severity of disease development. The disease occurs in both upland and irrigated rice but perhaps not with equal severity. Applications of fertilizers and minor elements had no pronounced effect. The disease has occurred on different soil types and in fields of different cropping sequence. Insect populations are known to vary both as to species and numbers of specific species. Studies in progress on the insect populations should provide information that may explain some of the variations in disease development.

The Cuba susceptible rice varieties seeded in December, January or early February have shown less damage than when sown in March, April or May. Date-of-seeding tests are in progress. While the date of seeding appears to be an important factor in Cuba, seasonal variations are relatively unimportant in Venezuela.

Insect Vectors

Hoja blanca has been recognized as having symptoms similar to those for the stripe disease of Japan (8, 9, 13). This disease is transmitted by a delphacid *Delphacodes striatella* Fall. (13) of the Fulgoroidea. While *D. striatella* has not been found in rice fields showing hoja blanca, several genera of delphacid leafhoppers occur together with many genera of cicadellid leafhoppers.[1] Malaguti, Diaz and Angeles (11) report transmission with leafhoppers. They were unable to obtain transmission by manual methods or by seeds from diseased plants. Acuña (2) reported *Sogata orizicola* Muir to be an important vector in Cuba and indicates that *S. similis* is not. *S. orizicola* has been identified in insect collections from fields of diseased rice in Cuba, Venezuela, Colombia and Belle Glade, Florida.[1] Other genera of leafhoppers are being tested as vectors.

Varietal Resistance

In 1957 the reaction of a large number of United States rice varieties, selections and introductions from the U. S. Department of

[1] According to reports on insect collections submitted to the Insect Identification Section, Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture.

TABLE 1. – *Tabulation of resistant entries in Hoja Blanca Nursery No. 1 by country of origin, grown in Cuba and Venezuela, 1957*

Country of origin	Number entries tested	Number classed as resistant	Number classed as moderately resistant
United States	831	48	29
China	528	135	77
Japan	290	182	45
Korea	105	50	32
Taiwan	49	45	1
Burma	5	0	0
India	29	2	2
Indonesia	10	0	0
Philippines	5	0	0
Thailand	4	1	0
Argentina	11	6	0
Brazil	12	3	0
Br. Guiana	3	0	0
Chile	2	2	0
Peru	16	1	2
Venezuela	16	2	0
Costa Rica	4	2	2
El Salvador	15	2	2
Haiti	15	1	0
Jamaica	2	1	1
Austria	2	0	1
France	11	6	1
Greece	2	0	1
Italy	31	15	4
Portugal	17	13	1
Spain	10	9	0
Yugoslavia	3	1	0
Iran	7	1	0
Turkey	26	7	6
Africa, except Egypt	15	0	0
Egypt	6	3	3
Miscellaneous	8	2	0
Total	2 090	540	210

TABLE 2. – *Hoja blanca ratings for the leading United States rice varieties and a group of resistant selections and minor varieties in Cuba and Venezuela, 1957*

Variety or selection	C.I. No.	FAO genetic stock No.	Hoja blanca ratings[a]				Possible[b] reaction
			Cuba		Venezuela		
			May	July	May	August	
Susceptible							
Fortuna	1 344	220	3	8	7	9	S
Caloro	1 561–1	221	3	7	7	–	S
Rexoro	1 779	214	2	7	8	8	S
Zenith	7 787	206	3	8	5	8	S
Magnolia	8 318	216	2	7	8	8	S
Texas Patna	8 321	221	2	7	6	8	S
Bluebonnet 50	8 990	1012	2	7	7	9	S
TP 49	8 991	1020	2	7	5	8	S
Century Patna 231	8 993	1014	3	5	7	8	S
Nato	8 998	–	3	6	6	9	S
Toro	9 013	–	3	8	6	9	S
Resistant							
Colusa	1 600	213	0	0	0	–	R
Arkrose	8 310	207	2	1	3	trace	MR
Asahi	8 312	–	trace	0	0	0	R
Lacrosse	8 985	1017	0	0	1	0	R
Lacrosse × Magnolia	9 001	–	2	0	0	0	R
Missouri R-500	9 155	–	1	0	1	0	R
Bruin Sel. × Zenith	9 209	–	0	0	trace	0	R
Lacrosse × 253			0	0	1	0	R
Lacrosse × Zenith-Nira			0	0	0	0	R
Lacrosse × Arkrose			0	trace	0	trace	R
Hyb. Mix 11-49-19-5	9 368		0	0	0	0	R

[a] Visual rating scale, 0-9. 0 = No disease. 9 = Severe disease.
[b] S = Susceptible; R = Resistant; MR = Moderately resistant.

Agriculture World Rice Collection was determined in tests conducted in Cuba and Venezuela (4). Hoja Blanca Nursery No. 1, consisting of 2,200 entries, was sown on two dates near Acariqua, Venezuela.[1] Ratings were made on the two plantings approximately 100 and 95 days, respectively, after seeding. The nursery of 2,200 entries and an additional nursery of 1,725 entries were grown in a test area near Jobabo, Cuba,[2] where observations were made at approximately 40 and 95 days after seeding. Throughout the nurseries certain United States varieties were included every 20 rows as "check" varieties. A scale of 0 to 9 was used for rating severity. Natural infection was heavy on susceptible entries at both locations.

A fairly large number of the entries were rated as resistant to hoja blanca, since they showed few or no diseased tillers and growth and grain development were normal. Table 1 gives the country of origin of the various entries and the resistant entries. As shown in Table 1, a large number of the resistant entries came from Japan, China, Taiwan or Korea. Most of the resistant entries were *japonica* types, which may be characterized as short-grain rices with rough, fairly narrow, dark green leaves. Similar types were observed among resistant entries from other countries of the world. Probably, if the origin of all the resistant entries included in the tabulation were known, the total number of resistant entries from Japan and China would be larger, or else there would be many duplications.

[1] In co-operation with Mr. Rufus K. Walker, Research Director, Narfarm, Valencia, Venezuela.

[2] In co-operation with Mr. William C. Davis, Vice-President, Arrozal Bartes, S.A.

All of the leading varieties and all the long-grain varieties grown in the United States were susceptible. Several minor United States short- and medium-grain varieties, such as Colusa, Asahi, Lacrosse and Missouri R-500, were resistant and Arkrose was moderately resistant (Table 2). In addition, a number of short- and medium-grain selections were resistant. Certain of the resistance selections are adapted types and, if necessary, they could be grown in the United States.

One of the objectives of the 1957 tests was to screen the U. S. Department of Agriculture rice collection for sources of hoja blanca resistance. As shown in Table 1, a fairly large number of entries which might be used in breeding to develop hoja blanca resistant varieties is available. However, most of these are short-grain or medium-grain rices. The very few long-grain entries that were rated as resistant are of undesirable plant types.

A check as to the origin or parentage of the resistant United States varieties and selections indicates that japonica or short-grain types are the sources of their resistance. Asahi is an introduced variety from Japan, while Colusa was selected from an introduction from Italy that originally came from China. Possibly the resistance of Lacrosse, Missouri R-500 and several selections came from short-grain parents. A number of resistant selections had Lacrosse as one of the parents. Some of the selections from each of two crosses between Lacrosse and a susceptible parent were resistant like Lacrosse, whereas others were completely susceptible. These results indicate that it should be possible to obtain resistant strains of all grain types.

LITERATURE CITED

1. ANONYMOUS. 1957. Hoja blanca rice disease found in Florida. *U.S. Dep. Agr. Release*, 2812-57, September 17, 1957. (Also, *Rice Jour.* 60 (11) : 10-11. 1957).
2. ACUÑA, G.J. 1958. Informe de la labor realizada por la " comisión para la investigación de las enfermedades del arroz " durante el mes de noviembre de mil novecientos cincuenta y siete. In *Informaciones de Interés General en Relación con el Arroz. Administración de Estabilización del Arroz. Boletín* No. 4 : 26-40.
3. ADAIR, C.R. and J.W. INGRAM. 1957. Plans for the study of hoja blanca, a new rice disease. *Rice Jour.* 60 (4) : 12.
4. ATKINS, J.G. and C. ADAIR. 1957. Recent discovery of hoja blanca, a new rice disease

in Florida, and varietal resistance tests in Cuba and Venezuela. *Plant Dis. Reptr.* 41 : 911-915.

5. Cralley, E.M. 1957. " Hoja blanca " – White leaf – A new disease of rice. *Arkansas Farm Research* 6 (5) : 9.
6. Green, V.E. Jr., and J.D. Panzer. 1958. Hoja blanca. *Rice Jour.* 61 (2) : 16, 19, 20, 23, 24, 26.
7. Green, V.E. Jr., and J.R. Orsenigo. 1958. Wild grasses as possible alternate hosts of " hoja blanca " (white leaf) disease of rice. *Plant Dis. Reptr.* 42 : 342-345.
8. Hashioka, Y. 1951. Rice stripe (*Oryza* virus 2). *Hokuriku National Agr. Exp. Sta. Farmers' Bull.*, 7 pp. (English summary).
9. Kawada, A., S. Kato, H. Mukoo and K. Fukunaga. 1954. *Insects and diseases of rice plants in Japan.* National Institute of Agricultural Sciences. 33 pp. Tokyo.
10. Malaguti, G. 1956. La " hoja blanca ", extraña enfermedad del arroz en Venezuela. *Agronomia Tropical* 6 : 141-144.
11. Malaguti, G., H. Diaz C. and N. Angeles. 1957. La virosis " hoja blanca " del arroz. *Agronomia Tropical* 6 : 157-163.
12. Mukoo, H. and T. Iida. 1957. Informe sobre la investigación de la hoja blanca del arroz en Cuba. *Divulgación Científica* (*Raya Blanca*). *Administración de Estabilización del Arroz, Boletín* 1 : 5-12.
13. Yamada, W. and H. Yamamoto. 1955. Studies on the stripe disease of rice plant. I. On the virus transmission by an insect, *Delphacodes striatella* Fallen (with English summary). *Okayama Pref. Agr. Exp. Sta. Spec. Bull.* 52 : 93-112.

Experiments on the Control of Red Harvester Ant, *Pogonomyrmex barbatus barbatus*, in the Central Plateau of Mexico [1]

WILLIAM R. YOUNG

Mexican Agricultural Program of the Rockefeller Foundation, Mexico, D.F., Mexico

THE red harvester ant, *Pogonomyrmex barbatus barbatus* (F. Smith), [2] occurs commonly throughout the high altitude central plateau of Mexico. The economic importance of this species derives chiefly from the fact that its expanding anthills and runways remove land from production. Serious losses also result, however, from its habit of storing many types of seeds for food. Seeds are often taken from maturing field crops or grasses located near the anthill, and freshly sown seed of crops such as alfalfa may be collected by the ants at planting time. In addition, ants of this species are aggressive and capable of inflicting painful bites and stings on men and domesticated animals, so that anthills located near dwellings are extremely troublesome..

Several chemicals have been tested against ants of the genus *Pogonomyrmex* by other workers. Gordon (5) obtained complete control in most cases with one application of 4 to 6 ounces of carbon disulfide or calcium cyanide applied to anthills of the Texas harvester ant, *Pogonomyrmex barbatus* var. *molefaciens* (Buckl.), causing damage to airport runways. Brett and Rhoades (3), in tests with chlordane and BHC against the red harvester ant, found that a 2.5 to 5 percent solution of chlordane in carbon tetrachloride or 95 percent ethyl alcohol applied at the rate of 100 to 200 cc. per anthill destroyed colonies within 24 hours. A 1 or 2 percent water suspension of BHC killed large numbers of ants but promoted new colonies because of its repellent action, and a 5 percent BHC dust barrier was not effective. Riherd (6) found that dusting the ground surface near the entrance to the anthill with chlordane, BHC or toxaphene was ineffective against the red harvester ant. Brett obtained good control of the Texas harvester ant with the following: carbon disulfide, ¼ pint poured into the entrance; calcium cyanide, 2 ounces applied in a 8-inch hole dug in the entrance; and chlordane 3 percent in carbon tetrachloride at one cup per colony and chlordane 3 percent in water at 1 quart per colony. A dust formulation of chlordane applied on the soil surface was much less effective. Wene and White (7) tested several insecticides applied in 1 gallon of water per anthill of *P. barbatus* var. *molefaciens*. Aldrin, dieldrin and heptachlor at 0.2 percent gave complete control for eight weeks. Chlordane at 0.2 percent gave 78 percent control for two weeks and 44 percent control after eight weeks. Toxaphene at 0.2 percent and BHC at 0.08 percent were ineffective. Barnes and Nerney (1) made the following recommendations for the control of the red harvester ant: a dust of 2 percent dieldrin or 5 percent chlordane applied in a band around the anthill; 4 ounces of carbon disulfide applied in the entrance and immediately covered; or methyl bromide at 1 to 2 ounces per entrance.

The primary purpose of the study reported here was to develop a measure for the control of the red harvester ant in Mexico. Experiments were conducted during the late summer and fall of 1955 and 1956 to determine which of five insecticides, selected on the basis of their performance reported by other workers and their availability and cost, was most effective and could be recommended for use under the conditions of the central plateau of Mexico. The tests were conducted near Chapingo, Mexico, where approximately 100 distinct anthills were infesting a small olive orchard.

---

[1] Paper No. 100 of the *Agricultural Journal Series*, of The Rockefeller Foundation.

[2] Identification kindly made by Dr. Marion R. Smith, United States National Museum, Washington, D.C.

Materials and Methods

Water suspensions of wettable powder of BHC, DTT, aldrin, dieldrin and chlordane were used. Since applications made directly to the entrance had been reported to be most effective, this method of application was adopted for all treatments. Before the insecticide was applied, 2 liters of water were poured into each entrance of the anthill through a small funnel connected to a glass tube by means of a short rubber hose. It was thought that this water would wet the tunnels and chambers of the anthill and thus permit further penetration of the insecticide mixture. The same quantity of water was applied to the untreated anthills used as checks. The quantity of insecticide to be used was then suspended in 1 liter of water, and the suspension was divided in equal parts according to the number of entrances and applied with the same funnel.

Before treatment and at varying intervals after the application, counts were made of the number of ants leaving the anthills. At the onset of the study an attempt was made to count the ants with a hand tabulator. It soon became apparent, however, that many ants were leaving the colony, returning, and then leaving again, in rapid succession. Special traps, which prevented the ants from returning to the colony, were therefore constructed with plexiglass for use in estimating the ant population in various treatments. Two of these traps are shown in position on entrances in Figure 1. As the ants leave the colony, they climb up the central cylinder of the trap and then fall into the chamber on the sides, where they are confined by the baffles. A small aperture on the side of each trap, which was sealed with a cork when the trap was in use, served for removal of the ants.

These traps were placed on the entrances for at least three minutes on each counting date. At the end of this time the ants were transferred to a jar containing 70 percent alcohol (Figure 2) and transported to the laboratory where they were later counted. All counts were then converted to the aver-

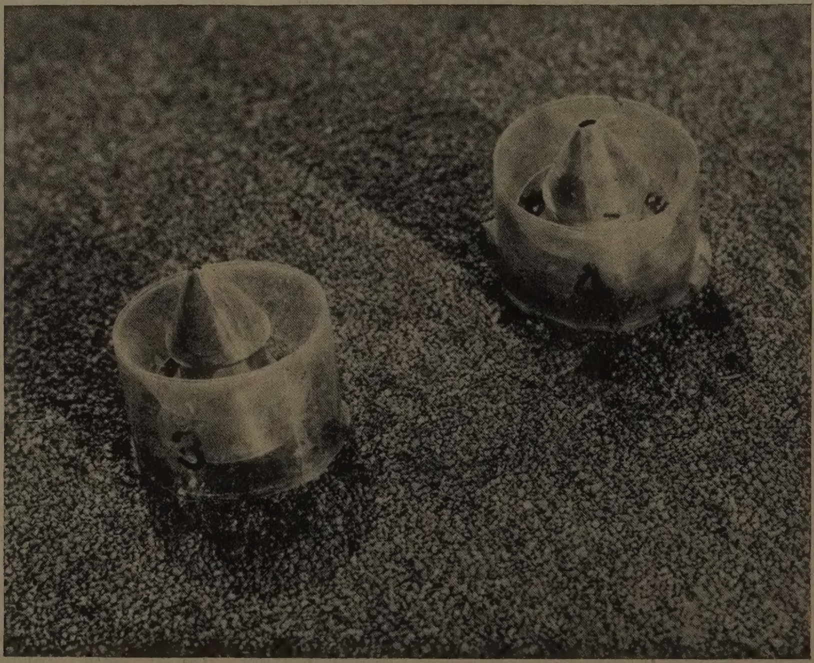

Figure 1. Special traps designed for counting ants at the entrance of ant hills.

Figure 2. Transferring ants through the aperture in the side of a trap to a jar containing alcohol to preserve them until counted in the laboratory.

age number of ants leaving each anthill per minute for each counting date.

Experiments in 1955

During the months of August and September 1955, 65 anthills were treated with five insecticides in each of three concentrates, replicated five times. The insecticide formulations used, all in wettable powder, are as follows: DDT 50 percent, BHC 10 percent, Chlordane 40 percent, Aldrin 25 percent, and dieldrin 50 percent. Fifteen more distinct colonies receiving water treatments were considered as untreated checks. Ant counts were taken before the treatments and also after 2 days, after 1, 2, 3 and 6 weeks, and after 12 and 21 months.

Preliminary results of this experiment were reported by González *et al.*(4). The complete results are presented below. The control obtained, as indicated by general suppression of the population at various time intervals after treatment, is presented in Table 1, where the average number of ants leaving the colonies per minute is shown.

Table 2 shows the effectiveness of the insecticides in terms of the percentage of hills in which complete control was obtained for each treatment. Neither of these tables includes data on all dates for all treatments, since counts could not be made on those days when heavy rains occurred. Results for the BHC treatments at the 21-month interval are not given because these anthills were retreated with different insecticides in the fall of 1956.

Little difference can be noted between concentrations with any of the materials tested. The low rate of application of chlordane, aldrin and dieldrin was just as effective as the high rate.

From the point of view of immediate and lasting control, both aldrin and chlordane were superior to the other insecticides tested. Dieldrin gave a good immediate

TABLE 1. – *Reduction of the red harvester ant population obtained during a period of 21 months with one application of insecticide, Chapingo, Mexico, fall 1955*

Insecticide and dosage, in grams of active ingredient per anthill	Average number of ants leaving colonies per minute							
	before application	After application at intervals of						
		2 days	1 week	2 weeks	3 weeks	6 weeks	12 months	21 months
DDT								
2.5	21.1	26.0	40.5	–	33.7	–	0	0
5.0	29.2	8.2	4.0	–	15.9	–	14.8	22.0
12.5	36.8	10.6	5.9	–	12.2	–	7.9	0
BHC								
2.5	99.0	–	–	61.8	77.6	–	204.7	–
5.0	27.6	–	–	15.4	20.1	–	84.6	–
12.5	42.6	–	–	25.4	26.2	–	92.6	–
Chlordane								
2.5	24.5	0.2	1.0	3.4	–	4.1	15.3	0.0
5.0	71.2	1.0	1.4	1.8	–	0.8	0.0	0.0
12.5	42.9	0.1	0.0	0.0	–	0.8	7.5	5.0
Aldrin								
2.5	25.9	0.5	0.1	0.3	–	0.0	7.1	5.2
5.0	59.8	1.5	1.3	0.1	–	1.4	0.0	0.0
12.5	35.6	0.0	0.0	0.0	–	0.0	0.0	6.0
Dieldrin								
2.5	37.2	–	2.3	–	–	6.2	23.2	35.8
5.0	58.6	–	3.6	–	–	9.9	22.5	27.0
12.5	52.6	–	0.9	–	–	14.1	25.8	33.2
Check	33.4	43.0	54.5	34.7	25.1	67.8	53.4	90.5

reduction in population but eliminated only a few of the hills. DDT was very slow in its action, although one year after the treatments were applied it was as effective as aldrin and chlordane. BHC provided practically no control and actually stimulated more activity in the anthills treated with it.

Experiment in 1956

On the basis of the results obtained in 1955 it seemed advisable to retest those insecticides that had been more effective. Since the low concentrations had given similar results to the high, it appeared that

TABLE 2. – *Percentage of hills of the red harvester ant in which complete control was obtained at various intervals after one application of insecticide, Chapingo, Mexico, fall 1955* [a]

Insecticide and dosage, in grams of active ingredient per anthill	Percent anthills with complete control after treatment at intervals of					
	1 week	2 weeks	3 weeks	6 weeks	12 months	21 months
DDT						
2.5	0	–	0	0	100	100
5.0	0	–	0	0	80	80
12.5	0	–	0	0	80	100
BHC						
2.5	–	0	0	–	20	–
5.0	–	0	0	–	20	–
12.5	–	0	0	–	0	–
Chlordane						
2.5	80	80	–	60	80	100
5.0	60	60	–	80	100	100
12.5	100	100	–	60	80	80
Aldrin						
2.5	80	80	–	100	80	80
5.0	80	80	–	80	100	100
12.5	100	100	–	100	100	80
Dieldrin						
2.5	60	–	–	20	40	40
5.0	20	–	–	20	40	60
12.5	80	–	–	20	40	40
Check	0	0	0	0	13	20

[a] Each treatment consisted of 5 anthills and the untreated check consisted of 15.

a still lower concentration of these materials might give satisfactory results. Accordingly, in the experiment conducted in the fall of 1956, aldrin, chlordane and dieldrin were used at the lowest concentration included in 1955 and also at one half that amount, 2.5 grams and 1.25 grams of active ingredient per anthill respectively. The methods of application and taking counts were the same as those of the previous year. A total of 37 anthills were treated, including five replications for each insecticide treatment and seven anthills as untreated checks. To make up this number of colonies, it was necessary to include several that had been treated with BHC in 1955. Counts were made before the application and after 48 hours and after 1, 2, 3, 6 and 37 weeks.

The data obtained are summarized in Table 3, indicating the general population suppression for each treatment. In Table 4 the percentage of colonies is given for each treatment in which complete control had been obtained on the dates indicated.

TABLE 3. – *Reduction of the red harvester ant population obtained during a period of 37 weeks after one application of insecticide, Chapingo, Mexico, fall 1956*

Insecticide and dosage, in grams of active ingredient per anthill	Average number of ants leaving colonies per minute						
	before application	After application at intervals of					
		2 days	1 week	2 weeks	3 weeks	6 weeks	37 weeks
Chlordane							
1.25	162.2	0.1	1.1	–	13.0	9.6	5.2
2.50	131.1	0.0	0.3	–	3.6	6.1	25.6
Aldrin							
1.25	98.5	0.0	0.6	–	0.6	1.1	0.0
2.50	67.4	0.1	0.0	–	0.1	0.5	0.0
Dieldrin							
1.25	89.5	3.3	–	11.3	19.7	9.4	46.2
2.50	77.2	3.3	–	6.7	12.8	7.0	49.6
Check	60.5	67.2	69.2	–	76.2	76.9	102.1

TABLE 4. – *Percentage of hills of the red harvester ant in which complete control was obtained at various intervals after one application of insecticide, Chapingo, Mexico, fall 1956*[a]

Insecticide and dosage, in grams of active ingredient per anthill	Percent anthills with complete control after treatment at intervals of					
	2 days	1 weeks	2 weeks	3 weeks	6 weeks	37 weeks
Chlordane						
1.25	80	40	–	0	0	80
2.50	100	80	–	40	40	60
Aldrin						
1.25	100	80	–	80	80	100
2.50	80	100	–	80	80	100
Dieldrin						
1.25	20	–	20	20	0	40
2.50	20	–	20	0	0	20
Check	0	0	–	0	0	14

[a] Each treatment consisted of five anthills and the untreated check consisted of seven.

Again the low concentrations were as effective as the high. Aldrin gave a good immediate suppression of population and complete control of the ten anthills treated with this compound after 37 weeks. Chlordane, though effective, was inferior to aldrin. Dieldrin suppressed the population for about six weeks, but failed to give complete control in seven of the ten anthills treated.

Conclusions

For the effective control of the red harvester ant, an insecticide should be rapid in action, causing a quick reduction in population, lasting in effectiveness and preventing a redevelopment of the colonies treated. Of the five insecticides tested in the two-year study at Chapingo, only two insecticides provided this type of control. Both aldrin and chlordane gave an immediate suppression of the ant population and completely eliminated most of the hills treated. Approximately one year after the treatments there was no activity in 23 of the 25 hills treated with chlordane. Although dieldrin caused considerable immediate reduction in population, it ultimately destroyed only 9 of the 25 hills treated. DDT was very slow in its action, though it did destroy 14 of the 15 colonies treated. BHC actually increased ant activity and destroyed only 2 of 15 colonies.

In the experiments conducted the concentration at which these materials failed to be effective was not reached. At the lowest concentration used, 1.25 grams of active ingredient per anthill, both aldrin and chlordane supplied economic control.

Literature Cited

1. Barnes, O.L., and N.J. Nerney. 1953. The red harvester ant and how to subdue it. *U.S.D.A. Farmers' Bull.* 1668.
2. Brett, C.H. 1950. The Texas harvester ant. *Okla. Agr. Exp. Sta. Bull.* B-353.
3. Brett, C.H., and W.C. Rhoades. 1946. Control of the red harvester ant with Velsicol 1068. *Jour. Econ. Ent.* 39 : 663-664.
4. Gonzáles C., Homero, W. R. Young, D. Barnes, and Antonio Jarquín C. 1955. Control de las hormigas. *Agricultura Técnica en México* No. 2.
5. Gordon, W.M. 1943. Airplane runways damaged by ants. *Jour. Econ. Ent.* 36 : 354.
6. Riherd, P.T. 1948. Results of tests made with some newer insecticides for the control of the red harvester ant, *Pogonomyrmex barbatus barbatus* (F. Smith). *Florida Ent.* 31 : 68-71.
7. Wene, G.P., and A.N. White. 1952. Control of the Texas harvester ant. *Jour. Econ. Ent.* 45 : 745-746.

Plant Quarantine Announcements

Argentina

1. Decree No. 17847 of 21 September 1956 provides that imported hop rhizomes be submitted to postentry quarantine in accordance with the condition established by the Ministry of Agriculture. If during the observation period plants are found infected with any virus disease that does not occur in Argentina, they will be destroyed. Other plants will remain under observation until there is proof that they are healthy.

2. Decree No. 1252 of 4 February 1958 authorizes the importation of certified seed potato through the port of Rosario if they comply with the existing regulation for importation of seed potatoes.

Seed potato shipments must be accompanied by a certificate of origin and a phytosanitary certificate issued at the port of shipment. On the certificate of origin it must be mentioned that the place of origin is free from potato wart disease (*Synchytrium endobioticum*), potato tuber moth (*Phthorimaea operculella*), Colorado beetle (*Leptinotarsa decemlineata*) and virus diseases. Virus-infected tubers are permitted up to 2 percent. Only certified seed potatoes may be imported and they must be inspected regularly by government officials or originate from official experiment stations of the country of origin. Each seed potato should weigh more than 40 grams but smaller tubers are permitted up to 5 percent.

The potatoes must be packed in cases of no more than 50 kilograms subdivided into two compartments. Each case must be labelled "certified" by the competent official service and indicate the name of the producer, the variety and the place of origin.

Federal Republic of Germany

An Ordinance of 10 June 1958, published in the *Bundesgesetzblatt* I No. 17 on 13 June 1958, amends Plant Inspection Ordinance of 23 August 1957 (see *FAO Plant Prot. Bull.* 6:27-29. 1957). These amendments refer mainly to the importation of cereals, dry pulses and oil cakes.

Provisions regarding obligatory certification for cereals, dry pulses and oil cakes will come into effect on 1 March 1959 instead of 1 July 1958 as originally provided, but inspection will begin on 1 July 1958.

The pests of stored cereals and dry pulses, as listed in the 1957 Ordinance and prescribed to be subject to restrictions, are stated to refer to living pests at any stage of development.

Soybeans have been deleted from the list of dry pulses, subject to plant inspection when infested by *Bruchidae*.

Samples of cereals, dry pulses and oil cake, as in the case of seed, are exempt from plant inspection.

The list of points of entry has been amended and supplemented.

North Borneo

The Plant Importation (Amendment) Rules of 12 March 1958, published in the second supplement to the *Government Gazette* Vol. 13 No. 7 on 1 April 1958, amend the Plant Importation Rules.

Importation of any plant from West Africa or any tropical American country is prohibited unless the plant has undergone intermediate quarantine in transit to the satisfaction of the director of agriculture and is accompanied by the prescribed certificate.

Importation of soil is prohibited and any rooted cutting imports must be free of soil.

Seeds of ornamental plants or vegetables packed in small packets may be imported from a temperate country without permission or certificate.

United Kingdom (England and Wales)

The Importation of Plants (Amendment) Order, of 10 July 1958, which came into operation on 7 August 1958, amends the Importation of Plants Order, 1955 (see *FAO Plant Prot. Bull.* 3:60, 1955) with regard to the importation of fresh fruit.

By the new amendment, the landing of raw apples, apricots greengages, nectarines, peaches, pears or plums grown in any European country, except Belgium, Denmark, Finland, Luxembourg, Norway, Sweden and the Netherlands, is prohibited, unless each consignment has been examined by an authorized officer of the phytopathological service of the country in which the fruit was grown and found by him to be free from San José scale (*Quadraspidiotus perniciosus*) and substantially free from all species of Lepidoptera, including Oriental fruit moth (*Laspeyresia molesta*). Each consignment must be accompanied by a health certificate, stating that the fruit has been found to be free of these pests.

News and Notes

FAO Desert Locust Control Committees

The Eighth Session of the FAO Technical Advisory Committee on Desert Locust Control, which convened at FAO Headquarters from 10 to 13 June 1958, was attended by delegates from France, India, Iran, Pakistan, the United Arab Republic, the United Kingdom and the United States of America. Saudi Arabia and UNESCO were represented by observers and the director of the Anti-Locust Research Center attached as consultant. An important conclusion was that the over-all desert locust situation was more serious than in June 1957 and that there was no reason to expect any early abatement of the plague. Considerable attention was given to imposing the exchange of locust information and it was hoped that the newly established International Desert Locust Information Service (see *FAO Plant Prot. Bull.* 6: 147-148, 1958) would assist in this direction: The Committee noted that the joint FAO UNESCO ecological survey of the main breeding areas of the desert locust had been initiated and that the first phase of the survey would be undertaken in the Sudan and Chad territory. The importance of developing and adopting enforced locust control techniques was emphasized as these and the use of insecticides at correct dosages should reduce the costs of antilocust campaigns.

The subsequent fifth session of the FAO Desert Locust Control Committee, which met from 16 to 21 June 1958, was attended by delegates from Ethiopia, France, India, Iran, Iraq, Italy (on behalf of Somalia), Libya, Morocco, Pakistan, Saudi Arabia, Spain, Tunisia, Turkey, the United Arab Republic, the United Kingdom and the United States of America. Of the many aspects of desert locust control discussed, the following were the salient:

1. Crop damage caused by the desert locust during the period 1949-1957 was estimated at US $42 million. It was concluded that the relative freedom of most countries from significant losses confirmed the value of the extensive antilocust operations taken by so many governments in recent years.
2. To meet the rapid spread of the desert locust in the Near East in early 1958, FAO contributed emergency aid to the approximate value of US $ 123,000, the USA gave assistance to the value of US $ 125,000, Iraq to the value of US $ 28,000 and the U.S.S.R. provided very substantial aid to the team. It was too early to estimate to what extent these outstanding examples of co-operation had curbed the further spread of the locust plague.
3. The cost of the 1957/58 international antilocust campaign in the Arabian Peninsula, in which missions from seven governments participated and to which many other governments contributed, was estimated at U.S. $1,350,000. It was concluded, however, that the campaign had been inadequate to prevent the formation of a considerable number of new swarms.
4. The 1958/59 campaign was planned at an estimated cost of U.S. $1.2 million. The foreseeable contribution from governments and FAO left an estimated deficit of U.S. $225,000. The Director-General of FAO was requested to discuss with governments that this deficit might be covered.
5. Emphasis was placed upon the need to reorganize further Arabian campaigns, particularly as regards stabilizing the budget through an agreed scale of contributions, the adoption of a single command and increased flexibility.
6. The recent spread of locust swarms from eastern Africa had again stressed the strategic importance of the Somali Peninsula, and the manner in which FAO might strengthen antilocust efforts in that area, particularly in Somalia, prior to that territory's independence in 1960, was discussed. The Governments of France and the United Kingdom pledged contributions to the value of U.S. $35,000.
7. Agreement was reached between France and the Arab states in northwestern Africa regarding the role of FAO in assisting to build up intergovernmental co-operation.
8. Five governments pledged financial contributions to assist FAO's program on the development of a long-term presentation policy of desert locust control.

Latin American Congress on Phytotechnology

The fourth Latin American Congress on Phytotechnology, organized by the Ministry of Agriculture of Chile in co-operation with the Rockefeller Foundation, will be held in Santiago, Chile, from 24 November to 6 December, 1958.

This Congress was organized to facilitate the exchange of information and research results, aiming at promotion of co-operative studies. Previous sessions were convened in Mexico City in 1949, in Brazil in 1952 and in Colombia in 1955, all under different names. The first session covered only plant pathology and applied entomology, and genetics and soil science were added to it since the third session.

The agenda of the fourth session includes the following items in the fields of plant pathology and entomology:

1. Insect biology and biological control, including the control of weeds by insects.
2. Insecticides and chemical control, including problems relating to insect resistance and toxic residues.
3. Other methods of control, including the sterilization of one sex and host resistance.
4. Pests of specific crops and their control, including the control of vectors of diseases.
5. Fundamental research on genetics and physiology of pathogenes.
6. Physiologic races, their origin and identification.
7. Obligate parasites and their culture in vitro.
8. Progress in fungicides and antibiotics.

Plant Protection and Plant Quarantine Conference

The ninth International Conference on Plant Protection and Plant Quarantine, convened by the Ministry of Agriculture of the Union of Soviet Socialist Republics, will be held in Moscow from 12 to 22 August, 1958. This Conference was initially organized by the Eastern European countries and the last session was held in 1956 in Peking, China.

The agenda of the Conference includes the following items and on each item reports will be presented by delegates of the participating countries:

1. New achievements in plant quarantine and plant protection.
2. Methods and trends in pest and disease control and their effect on natural balance.
3. Status and measures in the improvement of plant quarantine.
4. Results on the control of Colorado beetle and fall webworm in eastern Europe.
5. Forecasting and warning methods for outbreaks of plant pests and diseases.
6. Effective methods for the control of maize pests and diseases.
7. Methods for the control of forest tree pests and diseases.
8. Control of *Laspeyresia* spp.
9. Chemical control of weeds.
10. Virus diseases of plants and their importance.
11. Pests of stored products.
12. Consideration of the list of pests and diseases of quarantine importance.
13. Establishment of a permanent secretariat.

After the Conference, an excursion will be arranged to give the participants an opportunity of visiting research organizations.

Roma - Tip. del Senato del dott. Giovanni Bardi

SALES AGENTS FOR FAO PUBLICATIONS

Argentina: Editorial Sudamericana, S. A., Alsina 500, Buenos Aires;
Australia: H. A. Goddard Pty / Ltd., A. M. P. Bldg., 50 Miller St., N. Sydney, N. S. W.;
Austria: Wilhelm Frick Buchhandlung, Graben 27, Vienna 1;
Belgium: Agence et Messageries de la Presse, 14-22 rue du Persil, Brussels;
Brazil: Livraria Agir, Rua Mexico 98-B, Rio de Janeiro;
Burma: *(Wholesale)* Orient Longmans Private Ltd., 17 Chittaranjan Avenue, Calcutta 13, India;
Canada: The Ryerson Press, 299 Queen St. West, Toronto 2, Ontario; Periodica, 5090 av. Papineau, Montreal 34;
Ceylon: M. D. Gunasena and Co., Ltd., 217 Norris Road, Colombo 11;
Chile: Sala y Grijalbo Ltda, Bandera 140-F, Casilla 180 D, Santiago;
Colombia: "Agricultural Tropical," Carrera 12, No. 13-17, Bogotá; Librería Central, Calle 14, No. 6-88, Bogotá;
Costa Rica: Trejos Hermanos, Apartado 1313, San José;
Cuba: René De Smedt, La Casa Belga, O'Reilly 455, Havana;
Denmark: Einar Munksgaard, Norregade 6, Copenhagen K.;
Equador: "La Hacienda," Escobedo 1003 y P. Icaza, Casilla 3983, Guayaquil; Librería Muñoz Hnos. y Cía., Apartado 522, Quito;
Egypt: Librairie de la Renaissance d'Egypte, 9 Sh. Adly Pasha, Cairo;
El Salvador: Manuel Navas y Cía., 1ª Avenida Sur 35, San Salvador;
Ethiopia: International Press Agency, P. O. Box No. 120, Addis Ababa;
Finland: Akateeminen Kirjakauppa, 2 Keskuskatu, Helsinki;
France: Les Editions A. Pedone, 13 rue Soufflot, Paris 5e;
Germany: Paul Parey, Lindenstr. 44-47, Berlin SW 68;
Greece: "Eleftheroudakis," Constitution Square, Athens;
Guatemala: Sociedad Económico Financiera, Edificio Briz, Despacho 207, 6a Av. 14.33, Zona 1, Guatemala;
Haiti: Max Bouchereau, Librairie "A la Caravelle," Boîte Postale 111 B, Port-au-Prince;
Hong Kong: Swindon Book Co., 25 Nathan Road, Kowloon;
Iceland: Halldor Jonsson, Mjostraeti 2, Reykjavik; Jonsson & Juliusson, Garðastraeti 2, Reykjavik;
India: *(Wholesale)* Orient Longmans Private Ltd., 17 Chittaranjan Avenue, Calcutta 13; Nicol Road, Ballard Estate, Bombay 1; 36-A Mount Road, Madras 2; Kanson House, 24/1 Asaf Ali Road, Post Box 386, New Delhi 1, Gunfoundry Road, Hyderabad 1; *Retail Agent:* The Oxford Book and Stationery Co., Scindia House, New Delhi; 17 Park Street, Calcutta;
Indonesia: Pembangunan Ltd., 84 Gunung Sahari, Djakarta;
Iraq: Mackenzie's Bookshop, Baghdad;
Ireland: The Controller, Stationery Office, Dublin;
Israel: Blumstein's Bookstores Ltd., P. O. Box 4101, Tel Aviv;
Italy: Libreria Internazionale Ulrico Hoepli, Galleria, Piazza Colonna, Rome; A.E.I.O.U., Via Meravigli 16, Milan;
Japan: Maruzen Co. Ltd., Tori-Nichome 6, Nihonbashi, Tokyo;
Lebanon: Librairie Universelle, av. des Français, Beirut;
Malaya: Caxton Stationers Ltd., 13 Market Street, Kuala Lumpur;
Mexico: Manuel Gómez Pezuela e Hijo, onceles 12, México, D. F.;
Netherlands: N. V. Martinus Nijhoff, Lange Voorhout, 9, The Hague;
New Zealand: Whitcombe and Tombs Ltd., Auckland, Wellington, Hamilton, Chrischurch, Dunedin, Invercargill, Timaru;
Norway: Johan Grundt Tanum Forlag, Kr. Augustsgt. 7a, Oslo;
Pakistan: *(West)* W. F. Jeffrey Ltd., Mehersons Estate, Wood Street Karachi, 2; *(East)* Orient Longmans Private Ltd., 17 Nazimuddin Road, Dacca;
Panama: Agencia Internacional de Publicaciones, J. Menéndez, Plaza de Arango No. 3, Panama;
Paraguay: Agencia de Librerías de Salvador Nizza, Calle Pte. Franco, No. 39-43, Asunción;
Peru: Librería Internacional del Perú, S. A. Casilla 1417, Lima;
Philippines: The Modern Book Co., 518-520 Rizal Avenue, Manila;
Poland: Ars Polona, Krakowskie Przedmiescie 7, Warsaw;
Portugal: Livraria Bertrand, S.A.R.L., rua Garrett 73-75, Lisbon;
Spain: Librería Mundi-Prensa, Lagasca 38, Madrid, José Bosch Librero, Ronda Universidad 11, Barcellona; Librería General, Independencia 8, Saragossa;
Sweden: C. E. Fritze, Fredsgatan 2, Stockholm 16; Gumperts AB, Göteborg; Henrik Lindstahls Bokhandel, Odengatan 22, Stockholm;
Switzerland: Librairie Payot, S. A., Lausanne and Geneva; Hans Raunhardt, Kirchgasse 17, Zurich 1;
Syria: Librairie Universelle, av. Fouad 1er, Boîte postale 336, Damascus;
Taiwan: The World Book Company Ltd., 99 Chungking South Road, Section 1, Taipei;
Thailand: Requests for FAO publications should be addressed to: FAO Regional Office for Asia and the Far East, Maliwan Mansion, Bangkok;
Tunisia: Victor Boukhors, 4 rue Nocard, Tunis;
Turkey: Librairie Hachette, 469 Istiklal Caddesi, Beyoglu, Istanbul;
Union of South Africa: Van Schaik's Book Store, Pty. Ltd., P. O. Box 724, Pretoria;
United Kingdom: H. M. Stationery Office, P. O. Box 569, London S.E.1;
United States of America: Columbia University Press. International Documents Service, 2960 Broadway, New York, 27, N. Y.;
Uruguay: Hector d'Elia, Oficina de Representación de Editoriales, Plaza Cagancha No. 1342, Montevideo;
Venezuela: Suma, S. A., Sabana Grande 102, "El Recreo," Caracas;
Yugoslavia: Drzavno Preduzece, Jugoslovenska Knjiga, Terazije 27/11, Belgrade; Cankarjeva Zalozba, P. O. B. 41, Ljubljana.
Other Countries: Requests from countries where sales agents have not yet been appointed may be sent to: Distribution and Sales Section, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, Rome, Italy.

FAO publications are priced in U.S. dollars and in pounds sterling. Payment to FAO sales agents may be made in local currencies.